SECTION I.—AEROLOGY.

SOLAR AND SKY RADIATION MEASUREMENTS DURING FEBRUARY, 1916.

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[Dated: Weather Bureau, Washington, Mar. 22, 1916.]

For a description of instrumental exposures, and an account of the methods of obtaining and reducing the measurements, the reader is referred to the REVIEW for January, 1916, **44**:2.

From Table 1 it is seen that the monthly means of direct solar radiation intensities for Washington are about normal, for Santa Fe, N. Mex., they are slightly above normal, and for Madison, Wis., they are markedly above. The monthly maxima at Washington and Madison do not differ appreciably from the absolute February maxima for these stations. At Santa Fe they about equal the previously obtained annual maxima for the station.[1] At Madison and Lincoln the highest measurements with air mass 2.0 to 3.0, and at Santa Fe the highest measurements for the month, were obtained on days when the surface water-vapor pressure was at its minimum for the month, as shown by Table 2.

Skylight polarization measurements were obtained at Washington on only three days, and they give a mean of 61 per cent. The maximum, 65 per cent, measured on the 21st, is slightly above the average February maximum.

TABLE 1.—*Solar radiation intensities during February, 1916.*

[Gram-calories per minute per square centimeter of normal surface.]

WASHINGTON, D. C.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°	80.7°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
A. M.	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*
Feb. 3	......	......	*0.82	0.90	0.85	0.78	0.72	0.70	0.67	0.56	......
14	......	1.45	1.40	1.32	1.25	1.17	1.08	1.02	0.96	0.90	......
15	......	1.36	1.23	1.12	1.06	0.99	0.91	0.85	0.80	0.76	......
16	......	......	......	......	......	......	0.80	0.75	0.71	......	......
19	......	1.42	1.15	1.07	1.01	0.94	0.88	0.82	0.76	0.72	......
21	......	1.51	1.42	1.34	1.26	1.17	1.09	1.03	0.99	0.96	......
26	......	1.31	......	......	......	......	......	......	......	......	......
28	......	1.41	1.31	1.18	1.07	0.99	0.93	......	......	0.80	......
Monthly means	......	**1.41**	**1.30**	**1.16**	**1.08**	**1.01**	**0.92**	**0.86**	**0.82**	**0.78**	......
Departures from 9-year normals	......	**±0.00**	**+0.04**	**±0.00**	**±0.00**	**±0.00**	**±0.00**	**±0.00**	**+0.01**	**−0.03**	......
P. M.											
Feb. 7	......	......	......	1.14	1.00	0.96	0.90	0.84	0.80	0.77	......
14	......	......	1.36	1.26	1.20	1.11	1.04	0.99	0.95	0.90	......
15	......	......	1.17	1.06	0.84	0.77	0.71	0.66	0.61	0.55	......
21	......	......	1.39	1.15	0.96	0.84	0.76	0.71	0.64	0.59	......
Monthly means	......	......	**1.31**	**1.15**	**1.00**	**0.92**	**0.85**	**0.80**	**0.75**	**0.70**	......
Departures from 9-year normals	......	......	**+0.06**	**+0.01**	**−0.03**	**−0.01**	**−0.02**	**−0.04**	**−0.03**	**−0.06**	......

* Partial eclipse of sun.

[1] See this REVIEW for September, 1915, 43:440.

TABLE 1.—*Solar radiation intensities during February, 1916*—Contd.

MADISON, WIS.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°	80.7°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
A. M.	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*
Feb. 1	......	......	1.50	1.41	1.33	1.26	1.19	1.12	1.06	0.97	......
2	......	......	......	1.41	......	......	......	......	......	0.85	......
7	......	......	1.55	1.49	1.43	1.37	1.29	1.24	1.20	......	......
13	......	......	1.45	......	......	......	......	......	......	......	......
27	......	1.60	......	......	......	......	......	......	......	......	......
29	......	......	......	......	......	......	......	1.07	1.02	......	......
Monthly means	......	**(1.60)**	**1.50**	**1.44**	**(1.38)**	**(1.32)**	**(1.24)**	**1.14**	**1.09**	**(0.91)**	......
Departures from 6-year normals	......	**+0.09**	**+0.13**	**+0.14**	**+0.16**	**+0.11**	**+0.09**	**+0.14**	**+0.17**	**−0.03**	......
P. M.											
Feb. 1	......	......	......	1.44	1.36	......	......	......	......	......	......
7	......	......	1.57	......	......	......	......	......	......	......	......
9	......	......	1.30	1.29	1.21	......	......	......	......	......	......
Monthly means	......	......	**(1.46)**	**(1.36)**	**(1.28)**	......	......	......	......	......	......
Departures from 6-year normals	......	......	**+0.09**	**+0.06**	**+0.08**	......	......	......	......	......	......

LINCOLN, NEBR.

A. M.											
Feb. 1	......	......	1.52	1.48	1.37	1.11	......	......	......	......	......
2	......	......	......	1.29	......	......	......	......	......	......	......
8	......	......	......	1.25	......	0.98	......	......	......	......	......
13	......	......	1.48	1.39	1.30	1.21	1.12	1.04	......	......	......
15	......	1.53	1.44	1.35	1.25	1.16	1.07	0.97	......	......	......
16	......	......	1.36	1.22	1.02	......	0.96	......	......	......	......
17	......	1.47	1.38	1.30	......	......	......	......	......	......	......
18	......	......	1.50	1.43	1.35	......	......	......	......	......	......
19	......	1.33	......	1.20	1.09	0.98	0.88	0.80	......	......	......
20	......	1.49	1.42	1.33	1.25	1.18	1.11	......	......	......	......
21	......	1.48	1.34	1.23	1.15	1.06	0.96	......	......	......	......
23	......	......	......	1.40	1.34	1.27	......	1.09	1.01	......	......
24	......	......	......	1.37	1.28	1.20	1.13	......	0.98	0.93	......
29	......	......	......	1.15	......	0.96	......	......	......	......	......
Means	......	**1.46**	**1.43**	**1.31**	**1.24**	**1.11**	**1.03**	**0.98**	**(1.00)**	**(0.93)**	......
P. M.											
Feb. 1	......	......	1.49	1.42	1.36	1.30	1.23	1.17	1.11	......	......
2	......	......	1.45	......	......	......	......	......	......	......	......
14	......	......	1.22	......	......	......	0.85	......	0.72	0.65	......
16	......	......	......	1.29	......	1.07	......	......	......	0.75	......
17	......	......	1.37	......	......	......	......	......	......	......	......
21	......	......	1.36	1.27	1.20	1.12	1.05	......	......	0.87	......
23	......	......	1.42	1.30	1.20	1.12	1.04	0.97	0.89	......	......
Means	......	......	**1.38**	**1.32**	**1.25**	**1.15**	**1.04**	**(1.07)**	**0.91**	**(0.76)**	......

SANTA FE, N. MEX.

A. M.											
Feb. 1	......	1.66	......	1.48	......	......	......	......	......	......	......
3	......	1.65	1.54	1.44	......	......	......	......	......	......	......
8	......	1.53	1.34	......	......	......	......	......	......	......	......
10	......	1.54	1.49	......	......	......	......	......	......	......	......
11	......	......	1.43	1.22	......	......	......	......	......	......	......
14	......	1.60	1.52	1.44	1.32	......	1.22	......	......	......	......
16	......	1.61	1.49	1.41	1.30	1.27	1.20	1.13	1.07	......	......
18	......	......	1.35	1.24	1.19	1.16	......	......	......	......	......
19	......	1.59	1.51	1.44	......	......	......	......	......	......	......
23	......	1.61	1.52	1.43	1.36	1.27	1.16	1.06	0.99	......	......
Monthly means	......	**1.60**	**1.47**	**1.39**	**1.29**	**1.23**	**1.19**	**(1.10)**	**(1.03)**	......	......
Departures from 4-year normals	......	**+0.02**	**+0.02**	**+0.03**	**+0.03**	**±0.00**	**±0.00**	**±0.00**	**±0.00**	......	......

TABLE 2.—*Vapor pressure at pyrheliometric stations on days when solar radiation intensities were measured.*

Washington, D. C.			Madison, Wis.			Lincoln, Nebr.			Santa Fe, N. Mex.		
Date.	8 a.m.	8 p.m.	Date.	8 a.m.	8 p.m.	Date.	8 a.m.	8 p.m.	Date.	8 a.m.	8 p.m.
1916.	*Mm.*	*Mm.*	1916.	*Mm.*	*Mm.*	1916.	*Mm.*	*Mm.*	1916.	*Mm.*	*Mm.*
Feb. 3	2.62	1.88	Feb. 1	0.66	0.74	Feb. 1	0.66	0.91	Feb. 1	0.86	1.02
7	3.81	1.12	2	0.53	0.71	2	0.71	1.37	3	1.52	2.62
14	0.91	1.12	7	0.36	0.51	8	1.96	3.81	8	3.30	2.62
15	0.96	2.49	13	0.86	1.07	13	0.66	1.37	10	2.49	3.15
16	2.16	2.87	27	1.12	1.32	14	1.52	3.45	11	3.00	4.17
19	1.24	1.68	29	1.32	1.32	15	2.16	4.37	14	3.30	1.88
21	2.16	1.45				16	4.37	6.76	16	2.26	2.62
26	3.30	2.49				17	4.75	5.16	18	3.15	3.45
28	1.32	1.45				18	3.45	4.95	19	2.49	2.87
						19	3.99	6.76	23	2.87	3.00
						20	4.37	6.02			
						21	4.17	7.04			
						23	3.15	4.57			
						24	3.99	3.63			
						29	1.68	3.45			

TABLE 3.—*Daily totals and departures of solar and sky radiation at Washington, D. C., during February, 1916.*

[Gram-calories per square centimeter of horizontal surface.]

Date.	Daily totals.	Departure from normal.	Excess or deficiency since first of month.
1916.	*Gr.-cal.*	*Gr.-cal.*	*Gr.-cal.*
Feb. 1	36	−167	−167
2	21	−185	−352
3	283	74	−278
4	313	100	−178
5	199	− 17	−195
6	233	13	−182
7	242	18	−164
8	231	3	−161
9	38	−194	−355
10	275	38	−317
Feb. 11	210	− 31	−348
12	58	−187	−535
13	34	−215	−750
14	405	152	−598
15	381	124	−474
16	308	48	−426
17	260	− 4	−430
18	210	− 57	−487
19	382	111	−376
20	331	57	−319
Decade departure			− 2
Feb. 21	434	156	−163
22	295	14	−149
23	199	− 86	−235
24	12	−276	−511
25	68	−223	−734
26	321	26	−708
27	273	− 25	−733
28	425	124	−609
29	205	− 99	−708
Decade departure			−389
Deficiency since first of year (Gram-calories)			1,129
Deficiency since first of year (Per cent)			8.8

Table 3 shows that at Washington the total solar and sky radiation was below the normal during the first and third decades of February. The deficiency for the month is 9.6 per cent of the average February total radiation, and the deficiency since the first of the year is 8.8 per cent of the average amount of radiation received in January and February.

At Washington, therefore, while there was more than the average amount of cloudiness during February, when the sky was clear the solar radiation was of average intensity. At Madison, Lincoln, and Santa Fe it was above its average intensity.

METEOR OBSERVATIONS.

The report of the committee on meteors of the American Astronomical Society, recently published with other reports by the society, points out the importance of the study of meteors and its profound relation to the earth's atmosphere, its gases, and the absorption phenomena that take place in its upper strata. Further great advantages must result from the application of more accurate methods of observation and photographic record. The chairman, Prof. Cleveland Abbe, states that suggestions for the construction of a photographic meteor-graph as devised by himself, have been submitted to the Research Laboratory of the Eastman Kodak Co., Rochester, N. Y.; as also suggestions for a less desirable but simpler form for the general use of those interested in the subject. Having no funds at his disposal, he has urged the Kodak Co. to construct a few copies and put them on the market, so that the world may realize the importance of the work. The report concludes as follows:

"It is not likely that I shall be able to contribute much more to this study, but I hope the Astronomical Society will stimulate some abler member to devote himself to this important branch of Astro-meteorological and physical study."

AREQUIPA PYRHELIOMETRY.[1]

(Summarized for the REVIEW.)

This paper is a summary of observations taken at the station of the Harvard College Observatory at Arequipa, Peru ($\phi = 16° 22' 28.0''$ S.; $\lambda = 4^h 46^m 11.73^s$ W.; alt. 2,451 m.) by its observers, with a Smithsonian silver-disk pyrheliometer lent for the purpose by the Smithsonian Institution. The observations have been reduced at the Astrophysical Observatory of the Smithsonian Institution under the direction of its director, C. G. Abbot. Humidity determinations were made sometimes by means of whirled wet- and dry-bulb thermometers, sometimes by the recording hair-hygrometer.

Monthly mean values are given in the author's Table 2, which is here reprinted, for the following elements:

$e_{1.2}$, intensity of solar radiation at air mass 1.2 (sun's zenith distance, z, 24°, sec. $z = 1.2$).

a_2, the transmission coefficient, computed from measurements of radiation intensity with sun at $z = 60°$ and $z = 0°$.

p, pressure of aqueous vapor.

e_0, empirical solar constant, computed by formulæ I and II given below.

n, number of days on which radiation was observed. The means inclosed by parentheses are based on very meager data.

[1] *Abbot, C. G.* Arequipa pyrheliometry. Washington, 1916. 23p. 2 figs. 8°. (Smithsonian misc. coll., v. 65, no. 9. Publ. 2367.)